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FLOOD INSURANCE STUDY

CITY OF OAK HILL, FLORIDA

VOLUSIA COUNTY

JUNE 4, 1990

Federal Emergency Management Agency

COMMUNITY NUMBER: 120624

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

CITY OF OAK HILL,
VOLUSIA COUNTY,
FLORIDA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Oak Hill, Volusia County, Florida, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by the Federal Emergency Management Agency (FEMA) for purposes of the National Flood Insurance Program. The data were identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the National Flood Insurance Program. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the National and Technological Hazards Division, FEMA, Atlanta, Georgia, for consideration for revision of this study.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were obtained from the Flood Insurance Study for the Unincorporated Areas of Volusia County, Florida (Reference 1).

1.3 Coordination

On August 10, 1987, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the community and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of Oak Hill, Volusia County, Florida. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected based on the extent and validity of available existing hydrologic and hydraulic data. A detailed coastal flooding analysis was performed on the complete coastline of the City of Oak Hill, where the flooding source is the Atlantic Ocean.

Approximate methods of analysis were used to study all remaining areas having potential flood hazard that did not have detailed scientific or technical data available.

2.2 Community Description

The City of Oak Hill is located near the southeastern edge of Volusia County. Oak Hill is bordered on the east by the Atlantic Ocean and on all remaining sides, by the unincorporated areas of Volusia County. The city is served by U.S. Route 1, State Road A1A, and the Halifax River/Intracoastal Waterway. The 1980 population of the city was reported to be 938 (Reference 2).

Precipitation within the study area ranges between 48 inches and 64 inches per year. The wide range of precipitation is due to hurricane activity. The annual mean temperature of Oak Hill is approximately 70 degrees Fahrenheit.

2.3 Principal Flood Problems

Oak Hill is subject to storm surge flooding from the Atlantic Ocean as a result of hurricane and tropical storm activity. Flooding is caused by large tidal surges combined with wave action and heavy rainfall that accompany these storms.

2.4 Flood Protection Measures

Flood protection measures are not known to exist within the study area.

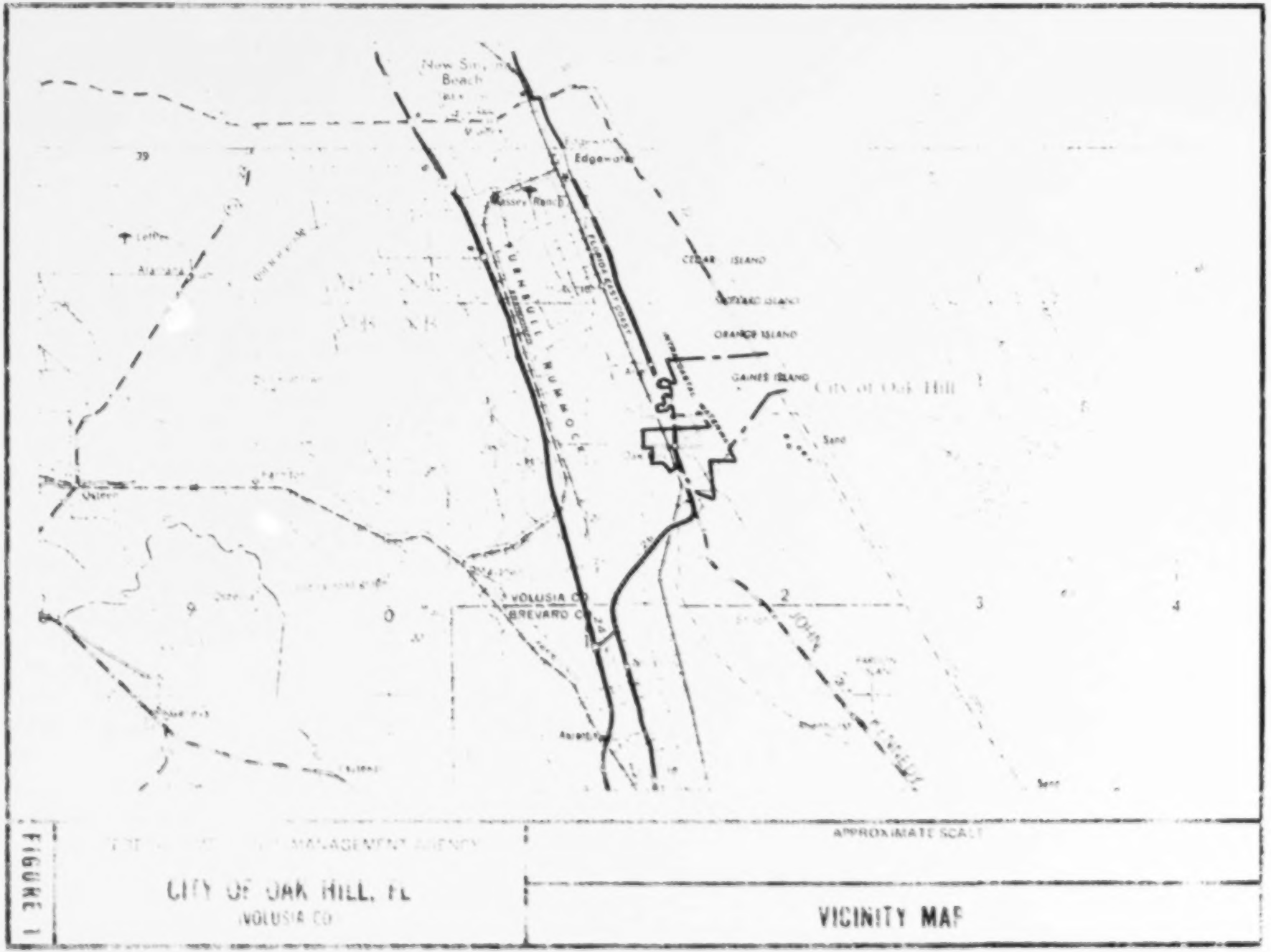

FIGURE 1

CITY OF OAK HILL, FL
VOLUSIA CO

VICINITY MAP

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40-percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60-percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Analyses were caried out to establish the peak elevation-frequency relationships for each flooding source studied in detail.

Inundation from the Atlantic Ocean caused by passage of storms (storm surge) was determined by the joint probability method (Reference 3). The storm populations were described by probability distributions of five parameters that influence surge heights. These parameters were central pressure depression (which measures the intensity of the storm), radius to maximum winds, forward speed of the storm, shoreline crossing point, and crossing angle. These characteristics were described statistically based on an analysis of observed storms in the vicinity of the City of Oak Hill. Primary sources of data for this analysis were "Tropical Cyclones of the North Atlantic Ocean, 1871-1977," "Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States," and "Meteorological Criteria for Standard Project Hurricane and Probable Maximum Hurricane Wind Fields, Gulf and East Coasts of the United States" (References 4-6).

For areas subject to flooding directly from the Atlantic Ocean, the FEMA standard storm surge model was used to simulate the coastal surge generated by any chosen storm (that is, any combination of the five storm parameters defined previously). By performing such simulations for a large number of storms, each of known total probability, the frequency distribution of surge height can be established as a function of coastal location. These distributions incorporate the large-scale surge behavior, but do not include an analysis of the added effects associated with much finer scale wave phenomena, such as wave height or runup. As the final step in the calculations, the astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level (Reference 7).

The storm surge elevations for the 10-, 50-, 100-, and 500-year floods have been determined for the City of Oak Hill and are shown in Table 1, Summary of Stillwater Elevations. The analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects but do not include the contributions from wave action effects.

3.2 Hydraulic Analyses

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the shorelines.

The FEMA storm surge model was utilized to simulate the hydrodynamic behavior of the surge generated by the various synthetic storms. This model utilizes a grid pattern approximating the geographical features of the study area and the adjoining areas. Surges were computed utilizing grids of 5 nautical miles, and 1,000 feet, depending on the resolution required.

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in a report prepared by the National Academy of Sciences (Reference 8). This method is based on the following major concepts. First, depth-limited waves in shallow water reach a maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest is 70-percent of the total wave height above the stillwater level. The second major concept is that wave height may be diminished by dissipation of energy due to the presence of obstructions, such as sand dunes, dikes and seawalls, buildings, and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures prescribed in Reference 8. The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

Wave heights were computed along transects (cross-section lines) that were located along the coastal areas, as illustrated in Figure 2, Transect Location Map, in accordance with the "Users Manual for Wave Height Analysis" (Reference 7). The transects were located with consideration given to the physical and cultural characteristics of the land so that they would closely represent conditions in their locality. Transects were spaced close together in areas of complex topography and dense development. In areas having more uniform characteristics, they were spaced at large intervals. It was also necessary to locate transects in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects.

Each transect was taken perpendicular to the shoreline and extended inland to a point where wave action ceased. Along each transect, wave heights and elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The stillwater elevations for the 100-year flood were used as the starting elevations for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave elevations were determined at whole-foot increments along the

FLOODING SOURCE AND TRANSECT	FLOOD INSURANCE RATE MAP PANEL	STILLWATER ELEVATION, FEET NGVD				ZONE	BASE FLOOD ELEVATION, FEET NGVD
		10 YEAR	50 YEAR	100 YEAR	500 YEAR		
ATLANTIC OCEAN							
1, 2	0005	N A	N A	8.0	N A	VE AE	10 12 8 10
ATLANTIC OCEAN INTRACOASTAL WATERWAY							
1, 2	0005, 0010	2.2	4.7	5.5	8.3	AE	6-8

[1] ROUNDED TO THE NEAREST FOOT AND MAY INCLUDE EFFECTS OF WAVE ACTION
[2] DUE TO MAP SCALE LIMITATIONS, BASE FLOOD ELEVATIONS SHOWN ON MAP MAY REPRESENT AVERAGE ELEVATIONS FOR THE ZONES DEPICTED

TABLE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF OAK HILL, FL
(VOLUSIA CO.)

SUMMARY OF STILLWATER ELEVATIONS

ATLANTIC OCEAN—INTRACOASTAL WATERWAY

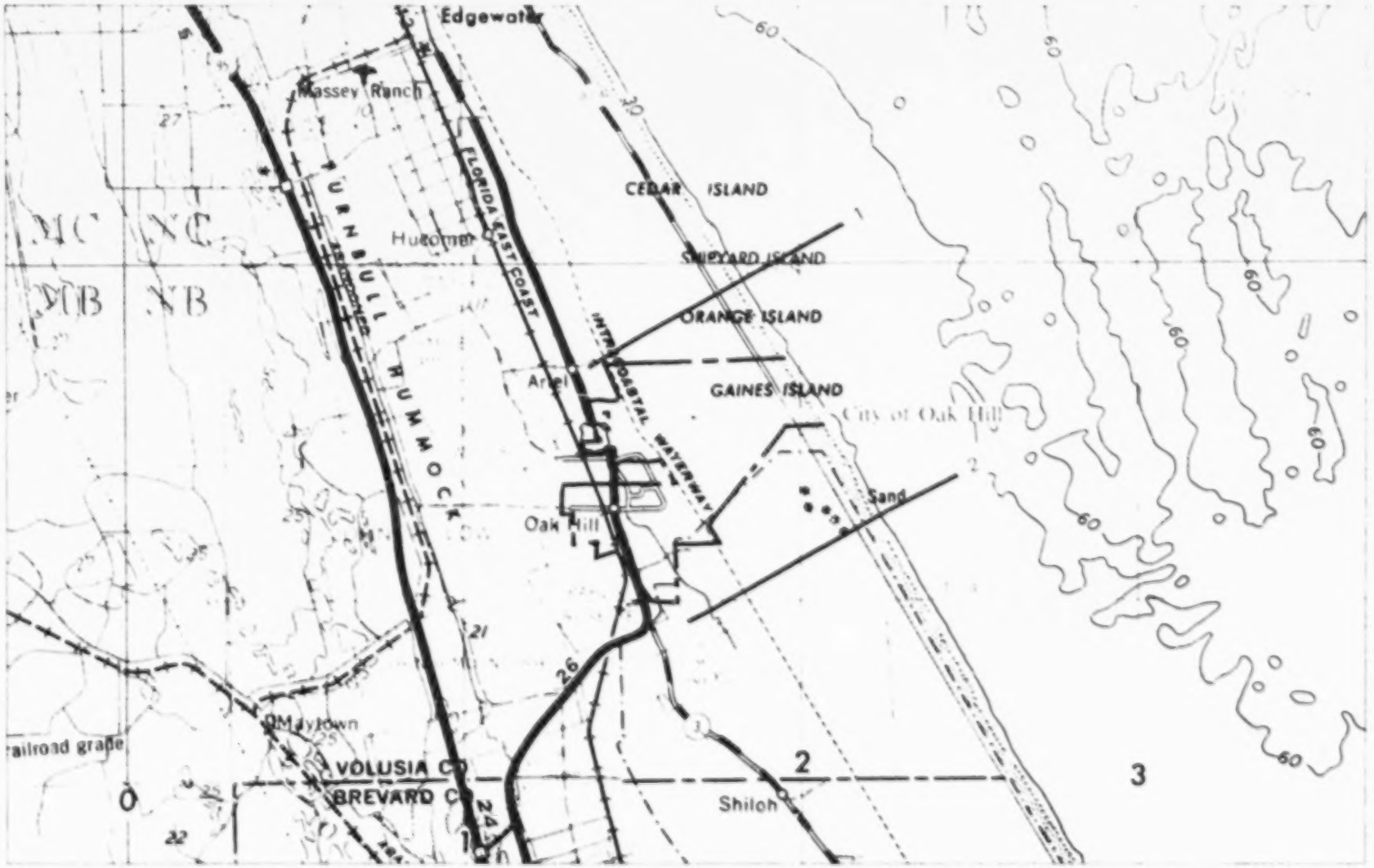

FIGURE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF OAK HILL, FL
(VOLUSIA CO.)

APPROXIMATE SCALE

TRANSECT LOCATION MAP

transects. The location of the 3-foot breaking wave for determining the terminus of the V zone (area with velocity wave action) was computed at each transect. Also, along the open coast, the V zone designation applies to all areas seaward of the heel of the primary dune system. Table 2 provides a listing of the transect locations and stillwater starting elevations, as well as initial wave crest elevations.

TABLE 2 - TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS

TRANSECT	LOCATION	ELEVATION (FEET) STILLWATER	ELEVATION (FEET) WAVE CREST
1	Between 17th Street and 18th Street from the Atlantic coastline westward across the Indian River North/Intracoastal Waterway floodplain	8.0	12
2	Approximately 7,000 feet north of South Street from the Atlantic coastline westward across Orange Island and the Indian River North/Intracoastal Waterway floodplain	8.0	12

[1]Atlantic Ocean at the open coast

Figure 3 represents a sample transect that illustrates the relationship between the stillwater elevation, the wave crest elevation, the ground elevation profile, and the location of the V/A zone boundary.

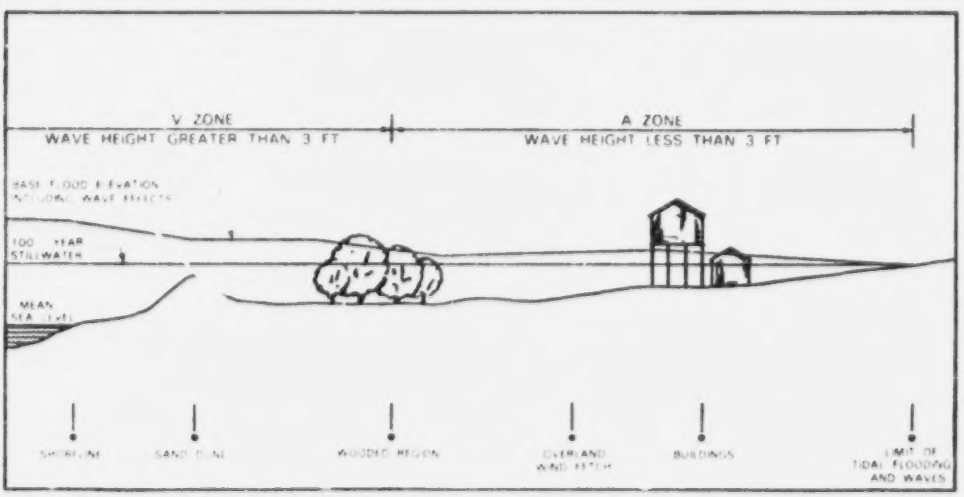

FIGURE 3 - Transect Schematic

After analyzing wave heights along each transect, wave elevations were interpolated between transects. Various source data were used in the interpolation, including topographic maps (References 9-11), beach profiles (Reference 12), aerial photographs (References 13-14), and engineering judgment. Controlling features affecting the elevations were identified and considered in relation to their positions at a particular transect and their variation between transects.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each flooding source studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each transect. Between transects, the boundaries were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 5 feet (Reference 9).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE) and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the flooding sources studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains.

7.0 OTHER STUDIES

A Flood Insurance Study is in progress for the Unincorporated Areas of Volusia County (Reference 1) and is in agreement with this study.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the map repository of flood hazard data located in the community.

9.0 REFERENCES AND BIBLIOGRAPHY

1. Federal Emergency Management Agency, Flood Insurance Study, Volusia County, Unincorporated Areas, Florida, October 1983, revision in progress.

2. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Florida, Washington, D.C., February 1982.

3. ----------, Environmental Sciences Services Administration, Technical Memorandum WBTM, Hydro 11, Joint Probability Method of Tide Frequency Analysis Applied to Atlantic City and Long Beach Island, New Jersey, Vance A. Myers, April 1970.

4. ----------, National Oceanic and Atmospheric Administration, National Weather Service, Tropical Cyclones of the North Atlantic Ocean, 1871-1977, June 1978.

5. ----------, National Ocean and Atmospheric Administration, Technical Report NWS 15, Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States, Francis P. Ho, Richard W. Schwerdt, and Hugo V. Goodyear, May 1975.

6. ----------, National Oceanic and Atmospheric Administration, Technical Report NWS 23, Meteorological Criteria for Standard Project Hurricane and Probable Maximum Hurricane Wind Fields, Gulf and East Coasts of the United States, Richard W. Schwerdt, Francis P. Ho, and Roger R. Watkins, 1979.

7. Federal Emergency Management Agency, Users Manual for Wave Height Analysis, revised February 1981.

8. National Academy of Sciences, Methodology for Calculating Wave Action Effects With Storm Surges, 1977.

9. U.S. Geological Survey, 7.5 Minute Series Topographic Map, Scale 1:24000, Contour Interval 5 feet: Oak Hill, Florida, 1949, photorevised 1970.

10. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Survey, Storm Evacuation Maps T-15074, T-15075, and T-15076, Scale 1:62500, Contour Interval 5 feet: Daytona Beach, Florida, 1977.

11. Florida Department of Natural Resources, Bureau of Beaches and Shores, Volusia County Coastal Construction Control Line, Preliminary, Scale 1:1200, Contour Interval 2 feet, photographed 1978.

12. ———, Bureau of Beaches and Shores, Volusia County Beach Profiles, Scale 1:600, 1972.

13. Federal Emergency Management Agency, Stereoscopic Aerial Photography of Volusia County, Florida, Scale 1:12000, January 1981.

14. Florida Department of Transportation, Stereoscopic Aerial Photography of Volusia County, Florida, Scale 1:12000, August 1978.